Reply to Office Action of 12/22/2005   Appl. No.: 09/975,944
Amendment Dated: December 28, 2005   Attorney Docket No.: CSCO-012 /4912

Listing of Claims

1   1 (Previously Amended): A method of processing a plurality of layer-3 datagrams in
2   a first edge router, said first edge router being connected to a second edge router by a layer-2
3   network, said method comprising:
4   provisioning in said first edge router a plurality of virtual circuits to said second edge
5   router on said layer-2 network, said plurality of virtual circuits being associated with a layer-
6   3 route;
7   receiving in said first edge router said plurality of layer-3 datagrams;
8   determining in said first edge router a subset of layer-3 datagrams, with each
9   datagram in said subset of layer-3 datagrams having a corresponding layer-3 route equal to
10   said layer-3 route, wherein said subset of layer-3 datagrams are comprised in said plurality
11   of layer-3 datagrams;
12   encapsulating each of said subset of layer-3 datagrams in a corresponding plurality
13   of layer-2 packets, all of the plurality of layer-2 packets corresponding to some of said subset
14   of layer-3 datagrams being encapsulated for sending on a first one of said plurality of virtual
15   circuits and all of the plurality of layer-2 packets corresponding to some other of said subset
16   of layer-3 datagrams being encapsulated for transmission on another one of said plurality of
17   virtual circuits; and
18   sending said plurality of layer-2 packets related to said subset of layer-3 datagrams
19   on said layer-2 network according to said encapsulating.

1   2 (Previously Amended): The method of claim 1, wherein said determining comprises
2   using a destination address comprised in each of said layer-3 datagrams to determine said
3   corresponding layer-3 route,
4   wherein said determining further determines whether to transmit each of said subset
5   of layer-3 datagrams in either said first one of said plurality of virtual circuits or said another
6   one of said plurality of virtual circuits, and
7   wherein said encapsulating comprises using a header which identifies the determined
8   virtual circuit for each layer-2 packet of the corresponding layer-3 datagram.

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1   3 (Original): The method of claim 2, wherein said layer-2 network comprises a

2   plurality of switches providing a plurality of physical paths between said first edge router

3   and said second edge router, said first one of said plurality of virtual circuits being provided

4   on a first one of said plurality of physical paths and said second one of said plurality of

5   virtual circuits being provided on a second one of said plurality of physical paths.

1   4 (Original): The method of claim 2, further comprising selecting one of said plurality

2   of virtual circuits for transmitting each of said subset of layer-3 datagrams, wherein said

3   encapsulating is performed after said selecting.

1   5 (Original): The method of claim 4, wherein said determining comprises retrieving

2   a route entry from a forwarding table using said destination address of a first IP datagram,

3   wherein said route entry indicates whether said IP route is to be used to transport said first

4   IP datagram, and wherein said selecting is performed based on said route entry.

1   6 (Original): The method of claim 5, wherein said determining is implemented in the

2   form of a process under the control of a scheduler, wherein said process and said scheduler

3   are implemented substantially in the form of software in said first edge router.

1   7 (Original): The method of claim 4, wherein said determining and selecting are

2   implemented using a data structure, which when traversed using said destination address

3   returns a layer-2 header corresponding to a virtual circuit on which a corresponding IP

4   datagram is to be sent.

1   8 (Previously Amended): The method of claim 7, wherein said determining and said

2   selecting are implemented in an interrupt handler and wherein said data structure comprises

3   a tree.

1   9 (Original): The method of claim 2, wherein layer-3 comprises Internet Protocol (IP)

2   such that layer-3 datagrams, layer-3 protocol, and layer-3 route respectively comprise IP

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3   datagrams, IP protocol, and IP route, and wherein said layer-2 comprises asynchronous

4   transfer mode (ATM) such that said layer-2 packets comprise ATM cells.

1   10 (Previously Amended): A computer readable medium carrying one or more

2   sequences of instructions for causing a first edge router to process a plurality of layer-3

3   datagrams in a first edge router, said first edge router being connected to a second edge

4   router by a layer-2 network, wherein execution of said one or more sequences of instructions

5   by one or more processors contained in said first edge router causes said one or more

6   processors to perform the action of:

7   provisioning in said first edge router a plurality of virtual circuits to said second edge

8   router on said layer-2 network, said plurality of virtual circuits being associated with a layer-

9   3 route;

10   receiving in said first edge router said plurality of layer-3 datagrams;

11   determining in said first edge router a subset of layer-3 datagrams, with each

12   datagram in said subset of layer-3 datagrams having a corresponding layer-3 route equal to

13   said layer-3 route, wherein said subset of layer-3 datagrams are comprised in said plurality

14   of layer-3 datagrams;

15   encapsulating each of said subset of layer-3 datagrams in a corresponding plurality

16   of layer-2 packets, all of the plurality of layer-2 packets corresponding to some of said subset

17   of layer-3 datagrams being encapsulated for sending on a first one of said plurality of virtual

18   circuits and all of the plurality of layer-2 packets corresponding to some other of said subset

19   of layer-3 datagrams being encapsulated for transmission on another one of said plurality of

20   virtual circuits; and

21   sending said plurality of layer-2 packets related to said subset of layer-3 datagrams

22   on said layer-2 network according to said encapsulating.

1   11 (Previously Amended): The computer readable medium of claim 10, wherein said

2   determining comprises using a destination address comprised in each of said layer-3

3   datagrams to determine said corresponding layer-3 route,

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4 wherein said determining further determines whether to transmit each of said subset

5 of layer-3 datagrams in either said first one of said plurality of virtual circuits or said another

6 one of said plurality of virtual circuits, and

7 wherein said encapsulating comprises using a header which identifies the determined

8 virtual circuit for each layer-2 packet of the corresponding layer-3 datagram.

1 12 (Original): The computer readable medium of claim 11, wherein said layer-2

2 network comprises a plurality of switches providing a plurality of physical paths between

3 said first edge router and said second edge router, said first one of said plurality of virtual

4 circuits being provided on a first one of said plurality of physical paths and said second one

5 of said plurality of virtual circuits being provided on a second one of said plurality of

6 physical paths.

1 13 (Original): The computer readable medium of claim 11, further comprising

2 selecting one of said plurality of virtual circuits for transmitting each of said subset of layer-

3 3 datagrams, wherein said encapsulating is performed after said selecting.

1 14 (Original): The computer readable medium of claim 13, wherein said determining

2 comprises retrieving a route entry from a forwarding table using said destination address of

3 a first IP datagram, wherein said route entry indicates whether said IP route is to be used to

4 transport said first IP datagram, and wherein said selecting is performed based on said route

5 entry.

1 15 (Original): The computer readable medium of claim 14, wherein said determining

2 is implemented in the form of a process under the control of a scheduler, wherein said

3 process and said scheduler are implemented substantially in the form of software in said first

4 edge router.

1 16 (Original): The computer readable medium of claim 13, wherein said determining

2 and selecting are implemented using a data structure, which when traversed using said

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3   destination address returns a layer-2 header corresponding to a virtual circuit on which a

4   corresponding IP datagram is to be sent.

1   17 (Original): The computer readable medium of claim 16, wherein said determining

2   and said selecting are implemented in an interrupt handler and wherein said data structure

3   comprises a tree.

1   18 (Previously Amended): A first edge router for processing a plurality of layer-3

2   datagrams, said first edge router being connected to a second edge router by a layer-2

3   network, said first edge router comprising:

4   means for provisioning a plurality of virtual circuits to said second edge router on

5   said layer-2 network, said plurality of virtual circuits being associated with a layer-3 route;

6   means for receiving in said first edge router said plurality of layer-3 datagrams;

7   means for determining in said first edge router a subset of layer-3 datagrams, with

8   each datagram in said subset of layer-3 datagrams having a corresponding layer-3 route

9   equal to said layer-3 route, wherein said subset of layer-3 datagrams are comprised in said

10   plurality of layer-3 datagrams;

11   means for encapsulating each of said subset of layer-3 datagrams in a corresponding

12   plurality of layer-2 packets, all of the plurality of layer-2 packets corresponding to some of

13   said subset of layer-3 datagrams being encapsulated for sending on a first one of said

14   plurality of virtual circuits and all of the plurality of layer-2 packets corresponding to some

15   other of said subset of layer-3 datagrams being encapsulated for transmission on another one

16   of said plurality of virtual circuits; and

17   means for sending said plurality of layer-2 packets related to said subset of layer-3

18   datagrams on said layer-2 network according to said encapsulating.

1   19 (Previously Amended): The first edge router of claim 18, wherein said means for

2   determining uses a destination address comprised in each of said layer-3 datagrams to

3   determine said corresponding layer-3 route,

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4　　　　wherein said means for determining further determines whether to transmit each of
5　said subset of layer-3 datagrams in either said first one of said plurality of virtual circuits or
6　said another one of said plurality of virtual circuits, and
7　　　　wherein said means for encapsulating uses a header which identifies the determined
8　virtual circuit for each layer-2 packet of the corresponding layer-3 datagram.

1　　　　20 (Original): The first edge router of claim 19, further comprising means for
2　selecting one of said plurality of virtual circuits for transmitting each of said subset of layer-
3　3 datagrams.

1　　　　21 (Original): The first edge router of claim 20, wherein said means for determining
2　retrieves a route entry from a forwarding table using said destination address of a first IP
3　datagram, wherein said route entry indicates whether said IP route is to be used to transport
4　said first IP datagram, and wherein said selecting is performed based on said route entry.

1　　　　22 (Original): The first edge router of claim 20, wherein said means for determining
2　and said means for selecting are implemented using a data structure, which when traversed
3　using said destination address returns a layer-2 header corresponding to a virtual circuit on
4　which a corresponding IP datagram is to be sent.

1　　　　23 (Original): A first edge router for processing a plurality of layer-3 datagrams, said
2　first edge router being connected to a second edge router by a layer-2 network, said first edge
3　router comprising:
4　　　　a memory storing data indicating that a plurality of virtual circuits are provisioned
5　to said second edge router on said layer-2 network, said data further indicating that said
6　plurality of virtual circuits are associated with a layer-3 route;
7　　　　an inbound interface receiving said plurality of layer-3 datagrams, wherein a subset
8　of layer-3 datagrams comprised in said plurality of layer-3 datagrams are to be transmitted
9　on said layer-3 route;

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10   a virtual circuit (VC) determination block determining to send some of said subset

11   of layer-3 datagrams on a first one of said plurality of virtual circuits and some other of said

12   subset of layer-3 datagrams on another one of said plurality of virtual circuits; and

13   an outbound interface sending each of said subset of layer-3 datagrams on a

14   determined one of said plurality of virtual circuits in the form of a plurality of layer-2

15   packets on said layer-2 network.

1   24 (Previously Amended): The first edge router of claim 23, further comprising:

2   a forwarding block determining that said subset of layer-3 datagrams are to be

3   transmitted on said layer-3 route based on a destination address contained in each of said

4   plurality of layer-3 datagrams, wherein said VC determination block determines the specific

5   virtual circuit on which to forward each of said subset of layer-3 datagrams after said

6   forwarding block determines that said subset of layer-3 datagrams are to be transmitted on

7   said layer-3 router,

8   a segmentation block segmenting each of said subset of layer-3 datagrams into a

9   plurality of payloads; and

10   an encapsulator encapsulating said plurality of payloads in a corresponding plurality

11   of layer-2 packets, wherein said plurality of layer-2 packets corresponding to each layer-3

12   datagram are encapsulated according to the determination of said VC determination block.

1   25 (Original): The first edge router of claim 24, wherein said layer-2 network

2   comprises a plurality of switches providing a plurality of physical paths between said first

3   edge router and said second edge router, said first one of said plurality of virtual circuits

4   being provided on a first one of said plurality of physical paths and said second one of said

5   plurality of virtual circuits being provided on a second one of said plurality of physical

6   paths.

1   26 (Previously Amended): The first edge router of claim 24, further comprising:

2   a forwarding table containing a plurality of route entries, wherein said forwarding

3   block retrieving a route entry from said forwarding table using said destination address of

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4   a first IP datagram, wherein said route entry indicates whether said IP route is to be used to

5   transport said first IP datagram, and wherein said VC determination block selects either said

6   first one of said plurality of virtual circuits or said another one of said plurality of virtual

7   circuits based on said route entry.

1   27 (Original): The first edge router of claim 24, further comprising a data structure,

2   which when traversed using said destination address returns a layer-2 header corresponding

3   to a virtual circuit on which a corresponding IP datagram is to be sent.

1   28 (Original): The first edge router of claim 2, wherein layer-3 comprises Internet

2   Protocol (IP) such that layer-3 datagrams, layer-3 protocol, and layer-3 route respectively

3   comprise IP datagrams, IP protocol, and IP route.

1   29 (Original): The first edge router of claim 28, wherein each of said plurality of

2   virtual circuits comprises a permanent virtual circuit (PVC).

1   30 (Original): The first edge router of claim 29, wherein datagrams related to the

2   same flow are transmitted on the same virtual circuit such that an end system need not re-

3   sequence the data in the received datagrams.